

## LARVAL SMARIDIDAE (ACARINA) FROM AUSTRALIA AND NEW GUINEA.

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(Eight Text-figures.)

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The first larval mite proven to belong to the family Smarididae Kramer 1878 was that of *Smaris prominens* (Banks, 1916), a species widely distributed in Australia. It was referred to this family by Womersley and Southcott in 1941, following experimental rearing of larvae taken in the field, parasitic upon the Psocopteron *Troctes divinatorius* L., to nymphs, which were easily correlated with adults taken in the same locality.

The genus *Hauptmannia* was erected by Oudemans in 1910 for his *Achorolophus longicollis*, a larval prostigmatid mite from Friesland, in Holland, described earlier in the same year. A second species, *H. brevicollis* Ouds. 1910, from Holland, was also referred to the genus. No further species were referred to the genus until 1934, when Womersley briefly described two species from Western Australia. *Hauptmannia* was referred to the family Erythraeidae by both Oudemans and Womersley. In 1946 Southcott pointed out that all larvae proven as Erythraeidae had the two lateral claws of the tarsi of the legs dissimilar, whereas in *Smaris* the lateral claws are identical, heavily ciliated, and that in *Hauptmannia* the lateral claws are identical, though unciliated. This similarity in arrangement between larval *Smaris* and *Hauptmannia*, plus the difficulty in fitting *Hauptmannia* into a scheme of larval Erythraeidae that was the result of a considerable amount of experimental rearing, caused the writer to suggest that *Hauptmannia* should be referred to the Smarididae, and on grounds of its geographical distribution, was possibly the larva of *Hirstiosoma* Womersley 1934.

In this paper Womersley's two Western Australian species—*Hauptmannia westraliensis* and *H. mullewaensis*—are re-described. A further species, *H. aitapensis* n. sp., from New Guinea, which is quite close to the genotype, is also described.

An aberrant larval prostigmatid mite from New Guinea, *Clipeosoma copiolorum* n. gen., n. sp., is described in this paper. It is referred to the Smarididae rather than to the Erythraeidae on account of its having identical lateral tarsal claws, these being ciliated, but so heavily so as in *Smaris*.

In this paper all the known larvae of the Smarididae are keyed, and an attempt is made to evaluate the characters of the larval genera.

*Key to the Larval Genera referred to the Family Smarididae.*

- A. Eyes two on each side.  
Dorsal scutum broader than long, roughly triangular or crescentic. Lateral tarsal claws identical, heavily ciliated, pulvilliform ..... *Smaris* Latr. 1796  
Known from only *Smaris prominens* Bks. 1916 (Australian).
- AA. Eyes one on each side.  
B. Anterior sensilla of dorsal scutum are anterior to the anterior pair of non-sensillary scutal setae. Claws of tarsus of leg ciliated. Palpal claw trifurcate, the third claw being short, basal, lying ventrally. Mandibles slender ..... *Clipeosoma*, n. gen.  
Genotype *Clipeosoma copiolorum*, n. sp. (New Guinea).
- BB. Anterior sensilla of dorsal scutum are behind the anterior pair of non-sensillary scutal setae. Claws of tarsus of leg not ciliated. Palpal claw single or bifurcate; the palpal tibia also carries a stout accessory peg or claw. Mandibles compact ..... *Hauptmannia* Ouds. 1910  
Genotype *Achorolophus longicollis* Ouds. 1910.

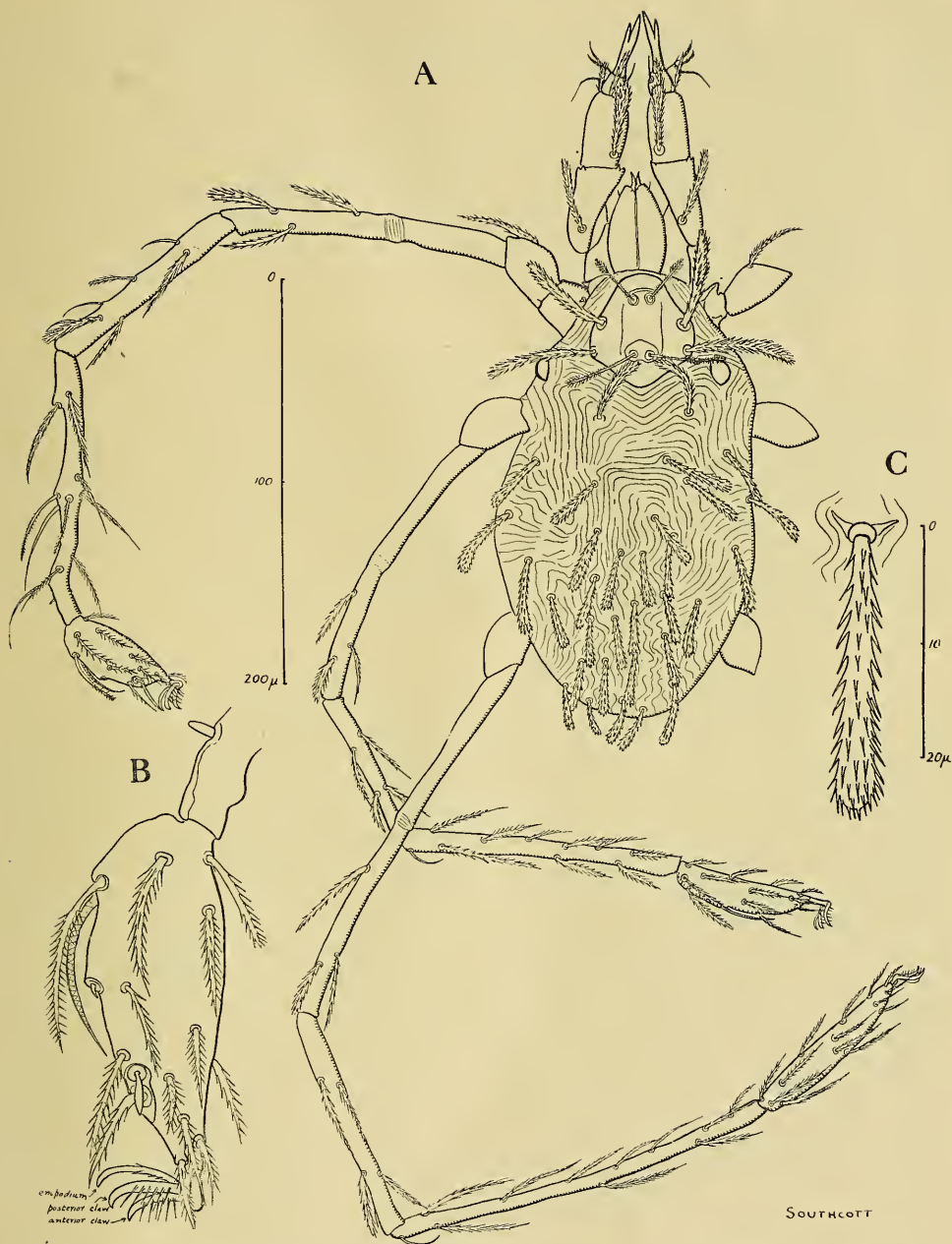


Fig. 1.—*Clipeosoma copiolarum*, n. gen., n. sp. Larva. A, Dorsal view; B, Tarsus I, posterior aspect; C, Dorsal seta.

Genus SMARIS Latreille.

*Précis car. gén. Ins.*, 1796, 180.

*Definition of Larval Characters.*—Eyes two on each side. Dorsal scutum broader than long, roughly triangular or crescentic, with two pairs of sensillary setae and two pairs of non-sensillary setae. The anterior pair of scutal sensillary setae arises between the levels of the anterior and posterior pairs of scutal non-sensillary setae; the posterior pair of sensillary setae arises at the posterior edge of the scutum. Ventrally one pair of setae between coxae I; one pair of setae between coxae III. Each coxa with one seta.

Each tarsus with one seta. Each trochanter with one seta. Tarsus I with a Haller's type organ, not present on tarsus II or III; tarsus I and II, but not III, with a solenoidal spine. Lateral tarsal claws identical, heavily ciliated, pulvilliform. Mandibles compact, rounded posteriorly.

*Remarks:* The above definition is based on one species only, *S. prominens* (Banks 1916), Australian, described by Womersley and Southcott (1941).

*Corrigendum:* In the figure of the larva of *Smaris prominens* given by Womersley and Southcott, 1941 [*Trans. Roy. Soc. S.A.*, 65 (1)], page 66, Fig. 2B, the trochanter of leg I appears to have two setae. Actually the proximal seta shown belongs to the coxa, and the distal seta only belongs to the trochanter; thus both coxa and trochanter of each leg have only one seta each.

#### Genus CLYPEOSOMA, n. gen.

*Definition:* Eyes one on each side. Dorsal scutum trapezoidal, with two pairs of sensillary setae and two pairs of non-sensillary setae. The anterior pair of sensillary setae arises anterior to the anterior pair of non-sensillary scutal setae; the posterior pair of sensillae arises well anterior to the posterior angle of the shield. Ventrally one pair of setae between coxae I, a further pair of setae between the levels of coxae II and III. Each coxa with one seta. Each trochanter with one seta. Tarsus I with a Haller's type sensory organ; not present on II or III. Tarsus I and tarsus II, but not III, carry a solenoidal spine. Lateral tarsal claws identical, falciform, ciliated. Mandibles slender. Claw of palpal tibia trifurcate, the third claw short, basal, lying ventrally.

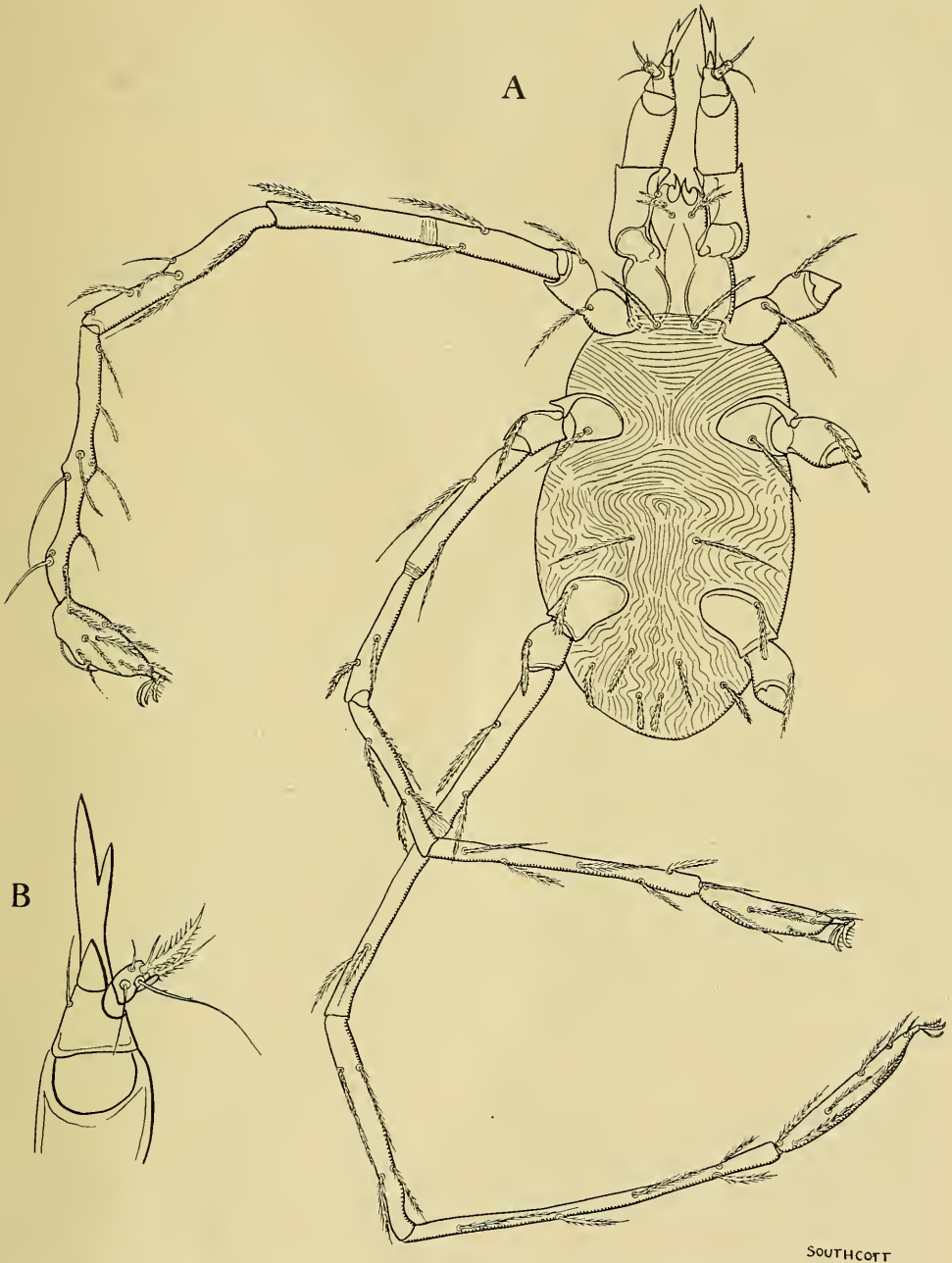
*Genotype:* *Clipeosoma copiolarum*, n. sp.

CLYPEOSOMA COPIOLARUM, n. sp. Fig. 1, A-C; Fig. 2, A, B.

*Description of Larva (Type):* Colour red. Body an elongate ovoid, 210 $\mu$  long by 110 $\mu$  wide. Dorsal scutum trapezoidal, with rounded angles, length 54 $\mu$ , width 52 $\mu$ . Scutum with two pairs of heavily ciliated slightly clavate sensillary setae, anterior 26 $\mu$  long, posterior 40 $\mu$  long; scutum also with 2 pairs of non-sensillary setae, stout, clavate and heavily ciliated, anterior 49 $\mu$  long, posterior 52 $\mu$  long. The anterior sensillary setae arise well anterior to the anterior pair of non-sensillary setae. Distance between centres of anterior and posterior sensilla 26 $\mu$ . Posterior sensilla arise well in advance of the posterior angle of the shield, and slightly behind the level of the posterior pair of non-sensillary scutal setae. Anterolateral borders of shield slightly concave, posterolateral borders also slightly concave. Eyes one on each side, level with the posterior end of the shield. Dorsum with about 31 setae, brown, stout, clavate, with dagger-shaped ciliations, setae 22-38 $\mu$  long, arranged in irregular rows across the dorsum. Venter: between coxae I a pair of long, pointed, heavily ciliated setae, 39 $\mu$  long; between the levels of coxae II and III a similar pair, 39 $\mu$  long; behind coxae III are 6 setae, heavily ciliated, the first row is of 4 setae, pointed apically, 20-23 $\mu$  long; the second row is of 2 setae, blunted, 16 $\mu$  long. Each coxa with one seta: that on I long, pointed, ciliated, 49 $\mu$  long; on II similar, 33 $\mu$  long; on III blunted, heavily ciliated, 27 $\mu$  long. Legs long and thin: I 505 $\mu$  long, II 520 $\mu$ , III 655 $\mu$  (all lengths including coxae and claws). Each trochanter with one seta. Tarsus I relatively thickened, 55 $\mu$  long by 24 $\mu$  high (exclusive of claws and columella). Tarsus I with a Haller's type sensory organ, not present on II or III; tarsus I and II, but not III, with a solenoidal spine. Tarsal claws strong, falciform, with ventral ciliations; empodium falciform, slender, with dorsal and ventral ciliations. Metatarsus I sinuous, irregular, 133 $\mu$  long, provided with various sensory setae. Capitulum: mandibles slender; chelicerae slender, with a short, straight cutting edge, without teeth or spurs. Palpi strong, elongate. Palpal coxa, femur, genu, tibia, tarsus with 0, 1, 1, 3, 6 setae respectively. Claw to palpal tibia trifurcate, dorsally there is a long medial and shorter lateral claw, ventrally there is a short conical basal claw (Fig. 2, B). Palpal tarsus as figured.

*Locality:* Babiang, in the Aitape region of New Guinea, a single specimen (Type), on the floor of the rain-forest, 19th December, 1944 (R.V.S.).

Type in author's collection (ACA 1389).



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Fig. 2.—*Clipeosoma copiotarum*, n. gen., n. sp. Larva. A, Ventral view; B, Tip of palp, ventral view.

Genus HAUPTMANNIA Oudemans 1910.

*Ent. Bericht.*, 1910, 3 (52): 48.

*Genotype*: *Achorolophus longicollis* Ouds. 1910.

*Re-definition of Genus*: Eyes one on each side. Dorsal scutum fairly broad, of varying shapes; with 2 pairs of sensillary setae and 2 pairs of non-sensillary setae; the anterior pair of sensillary setae lying between the levels of the 2 pairs of non-sensillary setae. Ventrally there are a number of setae between and behind coxae I, and between

the levels of coxae II and III. Coxa I with one seta, coxae II and III with one or 2 setae each. Each trochanter with 2 setae (in all the Australasian forms; possibly with only 1 seta in the European forms). Lateral tarsal claws identical, falciform, unciliated. Palpal femur with 2 setae. Palpal tibia with a strong simple or bifurcate claw, and also with a stout accessory peg or claw. Mandibles compact.

*Key to the Larval Genus Hauptmannia.*

- A. Claw of palpal tibia simple. Basis capituli with one seta on each side posterior to the palpal coxae. Posterior sensillary setae of dorsal scutum arise on the posterior edge of the scutum.
- B. Palpal tarsus with a pectinate seta.
- C. Setae between coxae I much longer than the setae on coxae I .....  
..... *H. longicollis* (Ouds. 1910) (European)
- CC. Setae between coxae I equal in length to, or shorter than, setae on coxae I .....  
..... *H. aitapensis*, n. sp. (New Guinea)
- BB. No pectinate seta on palpal tarsus ..... *H. brevicollis* Ouds. 1910 (European)
- AA. Claw of palpal tibia bifurcate. No setae on basis capituli behind palpal coxae. Posterior sensillary setae of dorsal scutum arise well anterior to the posterior edge of the scutum.
- D. Each coxa with one seta. Posterior sensillary setae of the dorsal scutum arise posterior to the middle of the shield. Dorsal scutum roughly oblong, with rounded corners, porose, without striations .....  
..... *H. westraliensis* Wom. 1934 (West Australian)
- DD. Coxa I with one seta, coxae II and III each with 2 setae. Posterior sensillary setae of dorsal scutum arise anterior to the middle of the shield. Shield heart-shaped, with a conspicuous waist, porose and also with striations .....  
..... *H. mullewaensis* Wom. 1934 (West Australian)

HAUPTMANNIA AITAPENSIS, n. sp. Fig. 3, A-F; Fig. 4.

*Description of Larva (Type)*: Colour red. Body ovoid, 350 $\mu$  long by 220 $\mu$  wide. Dorsal scutum pentagonal, 53 $\mu$  long by 41 $\mu$  across; the anterior margin of the shield slightly concave, the anterior part of the lateral margins straight, and parallel with each other, the posterior part of the lateral margins straight, and running obliquely medially and posteriorly to the blunt rounded posterior angle of the shield. Scutum with 2 pairs of fine, pointed, faintly ciliated sensillary setae; anterior pair 24 $\mu$  long, posterior 56 $\mu$ ; with 2 pairs of non-sensillary setae, tapering, pointed, with fine adpressed ciliations, anterior 41 $\mu$  long with bases 35 $\mu$  apart, posterior 30 $\mu$  long with bases 35 $\mu$  apart, distance between centres of anterior and posterior sensilla 41 $\mu$ . The anterior sensillary setae arise a little behind the level of the anterior non-sensillary setae, posterior sensillary setae arise at the posterior angle of the shield. Eyes one on each side, lateral to the posterolateral margins of the shield. Dorsum with about 47 tapering, pointed, curved setae, lightly pigmented, 20-31 $\mu$  long, with fine ciliations. Dorsal setae arranged 2, 2, 2, 4, 8, 7, 6, 4, 6, 4, 2. Venter: between coxae I a pair of curved spiniform setae, with very faint adpressed ciliations, 31 $\mu$  long; between coxae I and II are 4 similar setae, but with the ciliations a little more marked, 24-30 $\mu$  long; between coxae II and III a number of similar faintly ciliated setae, and also behind coxae III, 14-26 $\mu$  long. The more posterior setae are the stronger, and have freer ciliations. Each coxa with one seta, pointed, tapering, with fine ciliations; on I 31 $\mu$  long, on II 18 $\mu$ , on III 20 $\mu$ . Legs fairly stout, I 300 $\mu$  long, II 275 $\mu$ , III 315 $\mu$  (all lengths including coxae and claws). Each trochanter with 2 setae. Tarsi short, swollen. Tarsus I 41 $\mu$  long by 24 $\mu$  high (exclusive of claws and columella); dorsal setae of tarsus unciliated, ventral setae ciliated; solenoidal spine present on the dorsum of tarsus I and II, not on III. Tarsal claws strong, falciform, unciliated, identical, ridged obliquely along their sides; empodium slender, falciform, simple. Metatarsi stout, clavate; metatarsus I 52 $\mu$  long. Capitulum: mandibles compact; chelicerae stout, falciform, simple. Palpi strong, short; palpal coxa, femur, genu, tibia, tarsus with 0, 2, 3, 2, 8 setae respectively. Claw of palpal tibia single, bent over at the tip, and there excavated a little on the ventral side; the palpal tibia also carries an accessory claw on its dorsomedial aspect, close to the main palpal claw, with, however, a distinct separation. Palpal tarsus with various (8) sensory

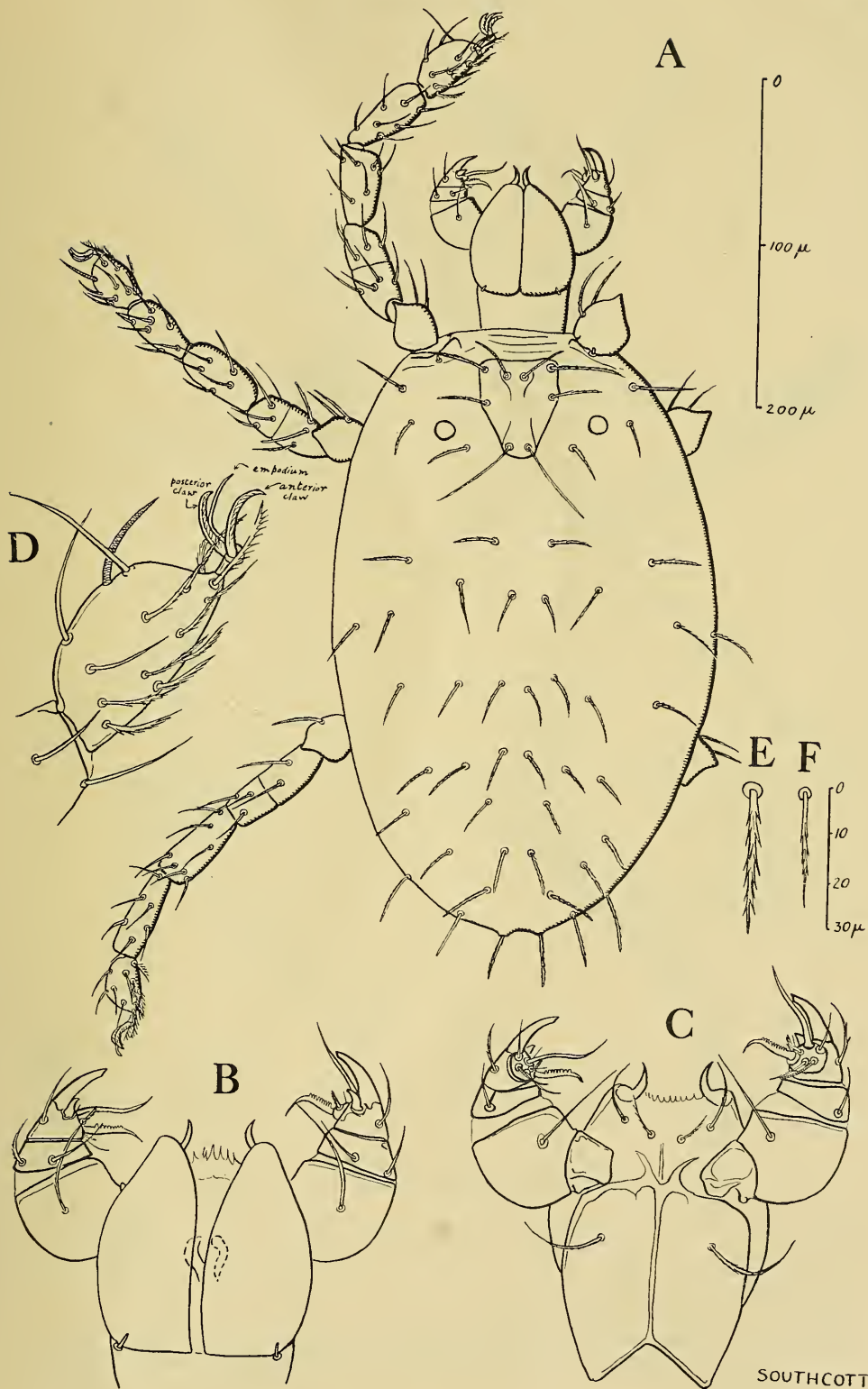


Fig. 3.—*Hauptmannia aitapensis*, n. sp. Larva. A, Dorsal view (mouthparts restored); B, Capitulum, dorsal view (mandibles distorted and separated by compression); C, Same, below; D, Tarsus I, anterior aspect; E, Dorsal seta; F, Ventral seta (both E and F are to the scale shown alongside).



Fig. 4.—*Hauptmannia aitapensis*, n. sp. Larva, ventral view.

setae, including a pectinate seta similar to that described for the genotype, also a solenoidal spine (see Fig. 3, B, C).

*Locality:* Deia Creek, in the Aitape region of New Guinea, a single specimen (Type), 30th December, 1944 (R.V.S.).

Type in the author's collection (ACA 1373).

*Remarks:* This species is quite close to the genotype, *H. longicollis* (Ouds. 1910) from Holland.

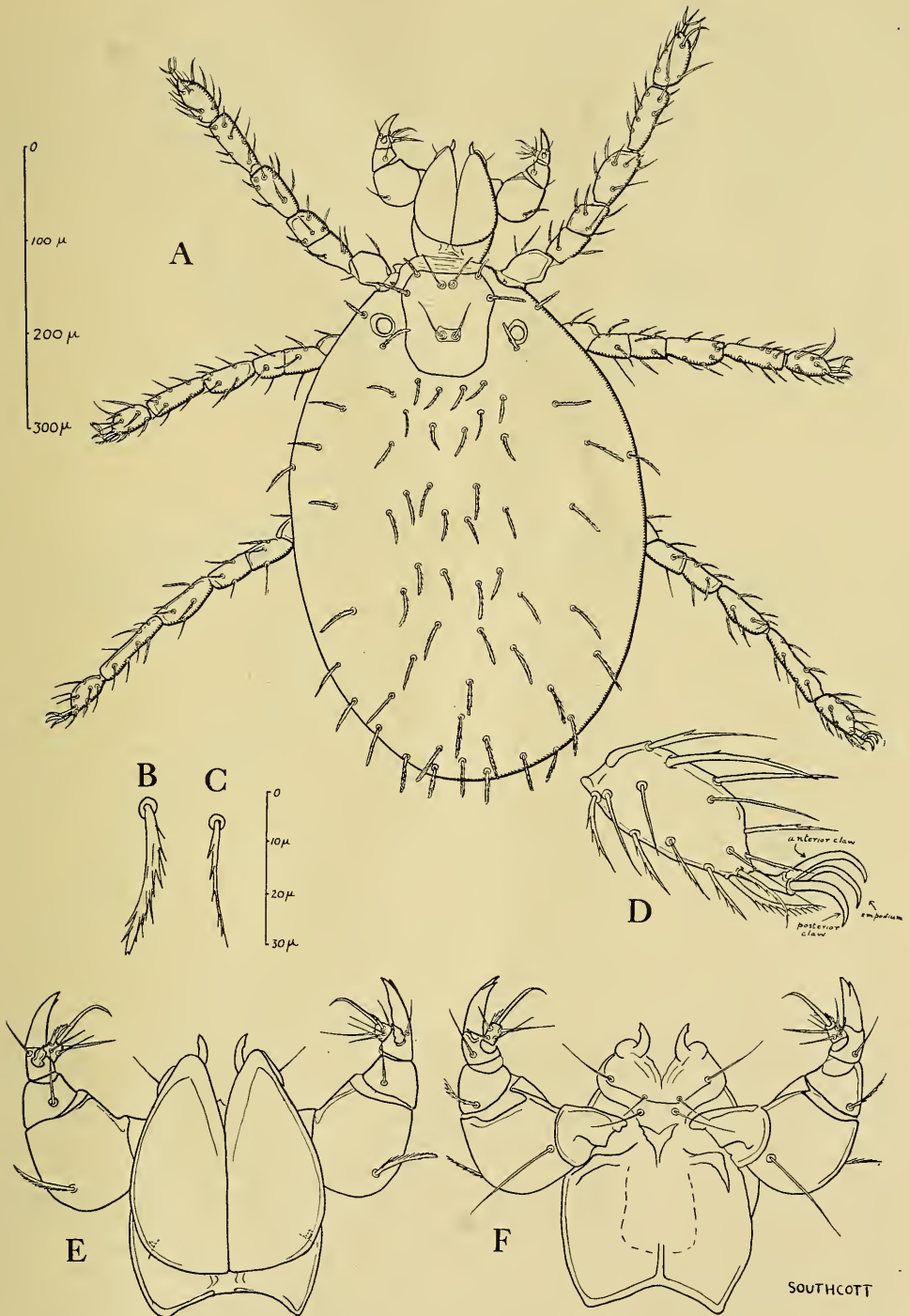


Fig. 5.—*Hauptmannia westraliensis* Wom. 1934. Larva. A, Dorsal view, entire; B, Dorsal seta; C, Ventral seta (both B and C are to the scale shown); D, Tarsus III, posterior aspect; E, Capitulum, dorsal aspect, slightly distorted by compression (the mandibles have separated anteriorly); F, Same, below.



## HAUPTMANNIA WESTRALIENSIS Womersley 1934. Fig. 5, A-F; Fig. 6.

*Rec. S. Aust. Mus.*, 1934, 5 (2): 249.

*Re-description of Larva (Type)*: Colour not recorded, probably red. Body ovoid, 550 $\mu$  long by 380 $\mu$  wide (over-all length of the Type specimen, from tip of chelicerae to posterior end of abdomen is 700 $\mu$ ). Dorsal scutum roughly rectangular, 118 $\mu$  long by 100 $\mu$  wide; its anterior margin is concave, the short anterolateral margins are straight, extending from the anterior scutal non-sensillary setae to the posterior, behind this the lateral margins run almost straight backwards until they finally curve sharply

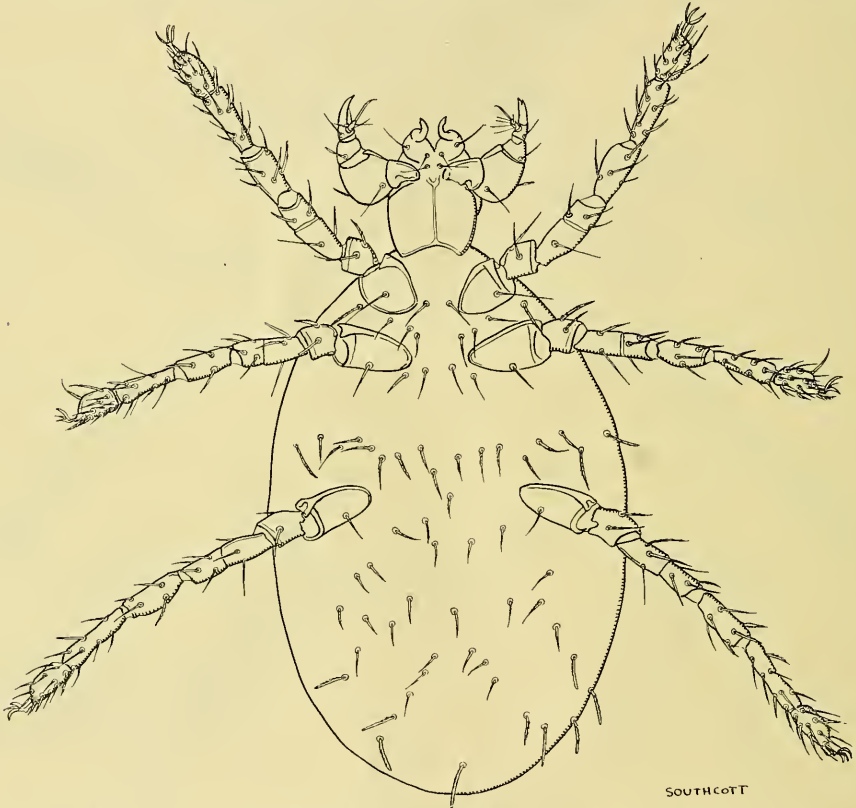


Fig. 6.—*Hauptmannia westraliensis* Wom. 1934. Larva, ventral view, entire.

medially, to run into the almost straight posterior border of the shield. Shield with 2 pairs of slender, pointed, lightly ciliated sensillary setae, anterior 39 $\mu$  long, the posterior pair 43 $\mu$  long, and these latter arising in a crescentic thickening in the shield; distance between centres of anterior and posterior sensilla, 41 $\mu$ . Scutal non-sensillary setae are short, stout, strongly ciliated, anterior 28 $\mu$  long, posterior 40 $\mu$  long. Anterior sensillary setae arise between the levels of the anterior and posterior pairs of non-sensillary setae; posterior sensillary setae arise behind the middle of the shield. Shield porose. Eyes one on each side, lateral to the shield. Dorsum with about 60 stout, blunted, unpigmented, strongly ciliated setae, 26–49 $\mu$  long, the more posterior setae being the longer. Venter: between coxae I a pair of slightly curved spiniform setae 30 $\mu$  long; between the levels of coxae I and II is a row of 8 spiniform setae with light ciliations; just behind coxae II a further row of 4 such setae; anterior to coxae III an irregular row of 17 setae, the central setae of this row spiniform with light ciliations, the more lateral setae more heavily ciliated, and the lateralmost 2 setae of the row quite heavily ciliated and 39 $\mu$  long; between and behind coxae III are about 32 setae, arranged in irregular rows, these setae becoming longer and more heavily ciliated

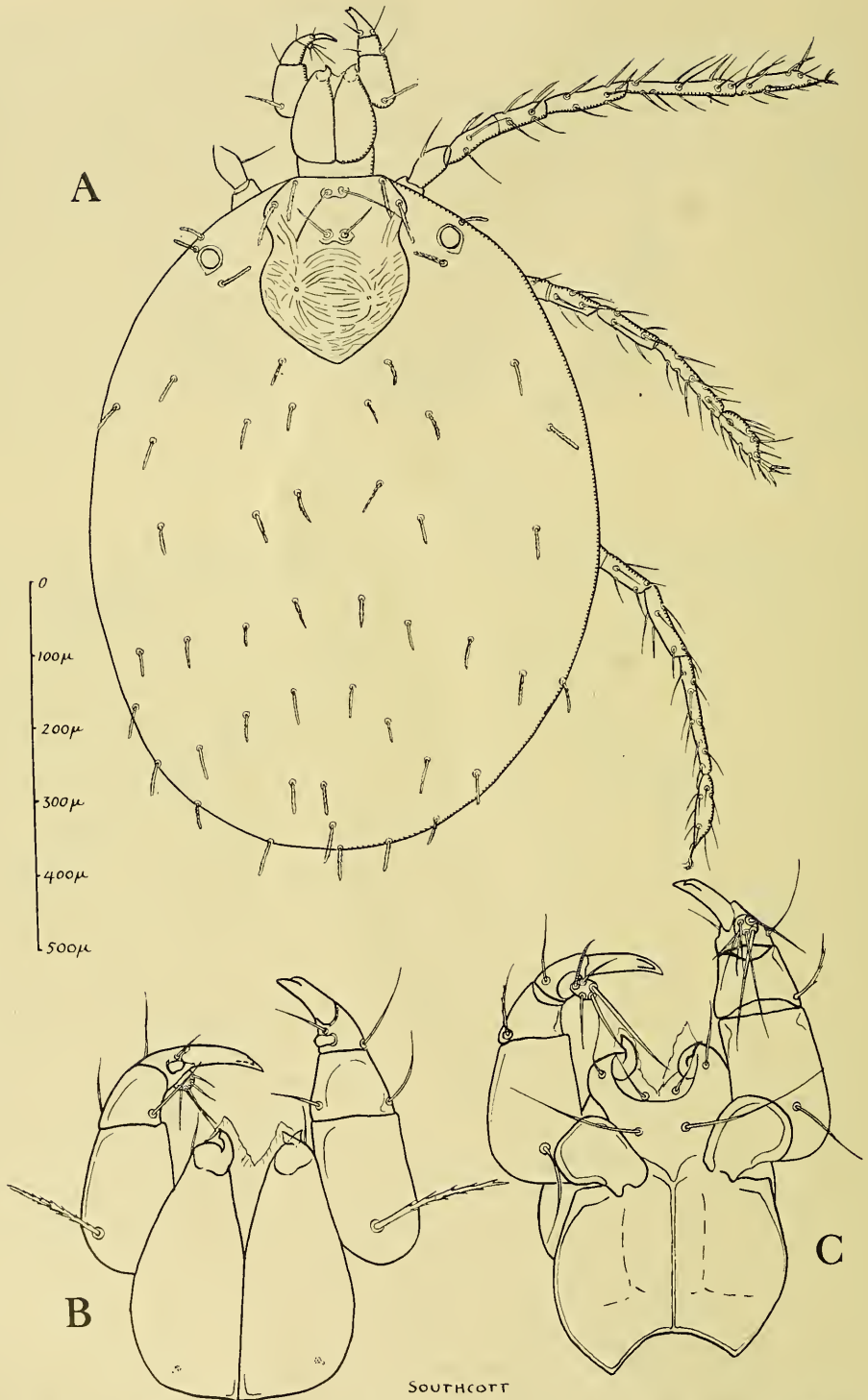
towards the posterior pole of the venter; ventral setae 24–40 $\mu$  long. Each coxa with one seta, spiniform, faintly ciliated; on I 54 $\mu$  long, on II 37 $\mu$ , on III 30 $\mu$ . Legs fairly strong, I 400 $\mu$  long, II 395 $\mu$ , III 450 $\mu$  (all including coxae and claws). Each trochanter with 2 setae. Tarsi of legs short; tarsus I 53 $\mu$  long by 30 $\mu$  high (exclusive of claws and columella). Dorsal setae of tarsus I almost spiniform, with only a few sparse ciliations, ventral setae ciliated; solenoidal spine present on dorsum of tarsus I and II, not on III. Tarsal claws falciform, strong, simple, identical; empodium falciform, slender. Metatarsi stout, clavate; metatarsus I 72 $\mu$  long. Capitulum: mandibles compact; chelicerae normal, with a short spur at the posterior end of the cutting edge. Basis capituli posterior to the palpal coxae devoid of setae. Palpi strong, short. Palpal coxa, femur, genu, tibia, tarsus with 0, 2, 2, 2, 8 setae respectively. Palpal tibia with a strong bifurcate claw, the minor tooth being on the ventrolateral aspect; a stout accessory peg to the claw also arises from the palpal tibia, on its dorsomedial aspect. Palpal tarsus with various (8) sensory setae, including a solenoidal seta, but without a pectinate seta.

*Locality*: "Chittering, Western Australia, October 16th, 1931, under stones" (H.W.) (slide labelled 10/10/31). A single specimen only, Type, in the South Australian Museum.

HAUPTMANNIA MULLEWAENSIS Womersley 1934. Fig. 7, A–C; Fig. 8, A–D.

*Rec. S. Aust. Mus.*, 1934, 5 (2): 250.

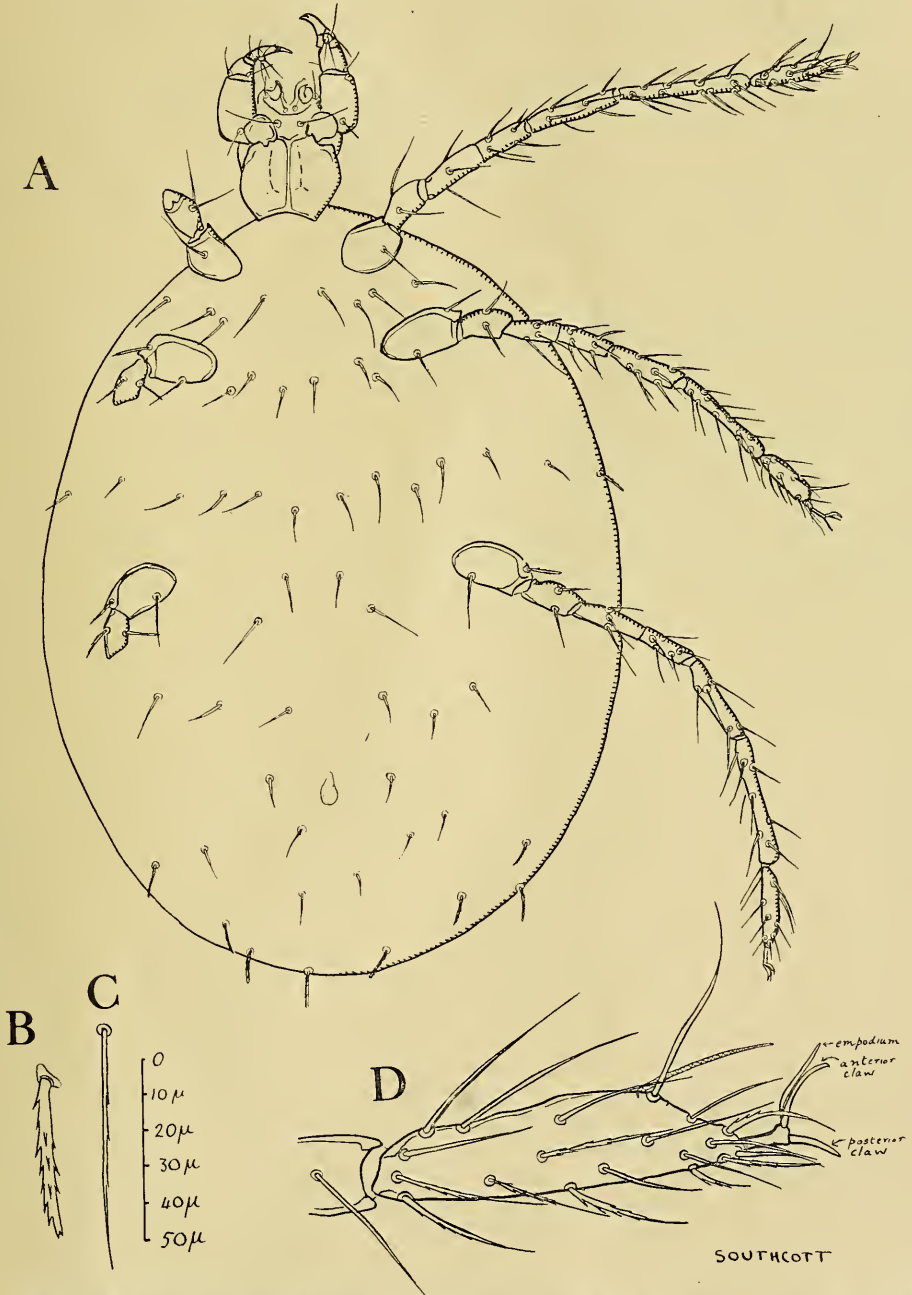
*Re-description of Larva (Type)*: Colour not recorded, probably red. Body ovoid, 915 $\mu$  long by 675 $\mu$  wide (over-all length of the Type specimen, from tip of chelicerae to posterior end of abdomen is 1040 $\mu$ ). Dorsal scutum somewhat heart-shaped, or shaped like a traditional shield, pointed posteriorly and waisted about the middle, 252 $\mu$  long by 190 $\mu$  wide in front of its constriction, 201 $\mu$  wide behind the constriction, and 165 $\mu$  wide at the constriction. Anterior border of shield slightly concave; anterolateral borders straight; the lateral borders are sinuous and in their posterior part sweep together to meet in a blunt, rounded point. Shield with 2 pairs of filiform sensillary setae with slender ciliations, anterior pair 68 $\mu$  long, posterior 47 $\mu$  long; with 2 pairs of long, blunted, strongly-ciliated non-sensillary setae, anterior 58 $\mu$  long, posterior 58 $\mu$  long; distance between centres of anterior and posterior sensilla 60 $\mu$ . The anterior sensillary setae arise behind the level of the anterior non-sensillary setae; the posterior pair of sensillary setae arises a little anterior to the waist of the shield, and well anterior to the middle of the shield. The shield is porose, but in addition the posterior half of the shield is striated, the striations being most marked peripherally; a few striations lead back from the sides of the anterior part of the shield, and run into the main striated area; the striations tend to radiate from two small thickenings in the shield. Dorsum with about 47 stout, blunted, unpigmented, strongly-ciliated setae, 28–45 $\mu$  long, the more posterior setae being the longer. The setae are arranged: 1 (or 2 teratologically) anterolateral to the eye, 1 posteromedial to the eye, then rows behind the shield of 5, 6, 6, 10, 8, 4, 3, 1 (the last 2 rows being confused). Venter: between the levels of coxae I and II a row of 8 setae, spiniform with a few ciliations, the 2 most medial setae being the most anterior of the row and 68 $\mu$  long, the other setae 24–58 $\mu$  long; just behind coxae II a row of 6 similar setae; anterior to coxae III a row of 13 setae; between and behind coxae III the setae of the venter are arranged 2, 2, 6, 2, 6, 5, 3; the most posterior of the ventral setae are the more strongly ciliated. The spiniform ventral setae are 42–80 $\mu$  long; the more heavily ciliated setae towards the posterior pole are 32–36 $\mu$  long. On the ventral surface, between the last row of 2 setae in the list of ventral setae just given, is a chitinous porose pyriform plate, the precursor of the anus. Coxa I with one long spiniform seta 83 $\mu$  long; coxa II with a somewhat more ciliated seta arising near its posterior border, 54 $\mu$  long, and a further seta, stouter, tapering, pointed, strongly ciliated, 39 $\mu$  long, arising from near the lateral end of the anterior border of the coxa; coxa III with 2 setae, placed as in coxa II, the postero-medial spiniform, almost unciliated, 54 $\mu$  long, the lateral seta ciliated, similar to the lateral seta on II, but has its terminal part broken off on each side in the Type specimen.



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Fig. 7.—*Hauptmannia mullewaensis* Wom. 1934. Larva. A, Dorsal view; B, Capitulum, dorsal aspect, slightly distorted by compression (the mandibles have separated anteriorly); C, Same, below.

Legs comparatively thin, I 635 $\mu$  long, II 610 $\mu$ , III 680 $\mu$  (all including coxae and claws). Each trochanter with 2 setae. Tarsus I 98 $\mu$  long by 26 $\mu$  high (exclusive of claws and columella). Dorsal setae of tarsus unciliated, ventral setae ciliated. Solenoidal spine present on the dorsum of tarsus I and II, not on III. Claws of tarsus falciform, strong, simple, identical; empodium falciform, more slender. Capitulum: mandibles compact; chelicera with a short spur at the posterior end of the cutting edge. Palpi strong, compact. Basis capituli posterior to palpal coxae is devoid of setae. Palpal coxa, femur,



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Fig. 8.—*Hauptmannia mullewaensis* Wom. 1934. Larva. A, Ventral view; B, Dorsal seta; C, Ventral seta (B and C to scale shown); D, Tarsus I, anterior aspect.

genu, tibia, tarsus with 0, 2, 2, 2, 8 setae respectively. Palpal tibia with a strong bifurcate claw, the lesser tooth being on the ventrolateral aspect; a stout accessory peg to the claw arises from the palpal tibia on its dorsomedial aspect. Palpal tarsus with 8 setae, including a solenoidal seta but without a pectinate seta.

*Locality:* Mullewa, Western Australia, September, 1931, on herbage (H. Womersley), a single specimen, Type.

Type in the South Australian Museum.

*Remarks:* This is the most divergent of the species referred to the genus.

#### REMARKS ON THE GENUS HAUPTMANNIA.

All the species referred to the genus in this paper have important points in common; these points are indicated in the key to the genera and the re-definition of the genus given earlier. The two European species form a compact group with *H. aitapensis*, n. sp. from New Guinea, while the two Western Australian forms diverge. The writer is not in favour of founding further genera until the adults of some at least of these species are known. It must be remembered that the status of this genus (and of *Clipeosoma* as well) as belonging to the Smarididae is as yet unproven.

#### ACKNOWLEDGEMENTS.

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